AD-A173 571 THE REPUBLIC OF KOREA ARMY LOGISTICS MANAGEMENT INFORMATION SYSTEM - MANAGER'S INVOLVEMENT(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA D H HONG JUN 86 1/1

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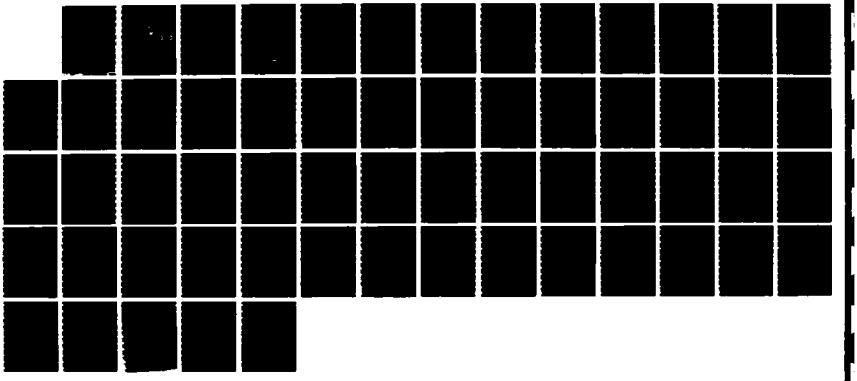

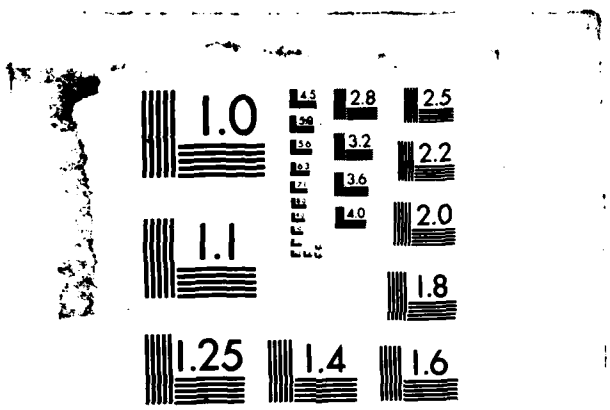

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

THE REPUBLIC OF KOREA ARMY LOGISTICS MANAGEMENT INFORMATION SYSTEM - MANAGER'S INVOLVEMENT -

by

Du Heun Hong

June 1986

Thesis Advisor: Michael P. Spencer

Approved for public release; distribution unlimited.

SECURITY CLASSIFICATION OF THIS PAGE

AD-A173 571

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Naval Postgraduate School 6b. OFFICE SYMBOL (If applicable) Code 54	7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School
6c. ADDRESS (City, State, and ZIP Code) Monterey, California 93943-5000	7b. ADDRESS (City, State, and ZIP Code) Monterey, California 93943-5000
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
THE REPUBLIC OF KOREA ARMY LOGISTICS MANAGEMENT INFORMATION SYSTEM - MANAGER'S INVOLVEMENT -

12. PERSONAL AUTHOR(S)
Hong, Du Heun

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Master's Thesis	FROM _____ TO _____	1986 June	59

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Management Information System, Logistics Management Information System, Information Requirement Determination, Manager's Involvement

19. ABSTRACT (Continue on reverse if necessary and identify by block number) One of the major causes for the failure of ROK Army Logistics Management Information System (MIS) is that it does not satisfy the user's information requirements. This, in turn, is most often caused by the fact that those requirements are difficult to obtain accurately and completely.

Simply asking the user what he needs is inadequate without managers' involvement. This thesis reviews the current ROK Army Logistics MIS problems and focuses on the involvement of the manager in information requirements determination in the development of MIS.

Three alternatives are presented to increase the manager's involvement involving user self-determination of needs in the ROKA Logistics MIS development. The study concludes that the use of coordination groups represents the most practical and effective solution to the ROKA's Logistics MIS problems.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Michael P. Spencer	22b. TELEPHONE (Include Area Code) (408) 646-2623 22c. OFFICE SYMBOL 54Sp

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

Approved for public release; distribution is unlimited.

THE REPUBLIC OF KOREA ARMY LOGISTICS MANAGEMENT INFORMATION SYSTEM - MANAGER'S INVOLVEMENT -

by

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Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
June 1986

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ABSTRACT

One of the major causes for the failure of ROK Army Logistics Management Information System (MIS)is that it does not satisfy the user's information requirements. This, in turn, is most often caused by the fact that those requirements are difficult to obtain accurately and completely.

Simply asking the user what he needs is inadequate without managers' involvement. This thesis reviews the current ROK Army Logistics MIS problems and focuses on the involvement of the manager in information requirements determination and the importance of information requirements determination in the development of MIS.

Three alternatives are presented to increase the manager's involvement involving user self-determination of needs in the ROKA Logistics MIS development. The study concludes that the use of coordination groups represents the most practical and effective solution to the ROKA's Logistics MIS problems.

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I. INTRODUCTION

When the computer appeared in society, its functions were generally clerical tasks, such as performing complex scientific calculations, processing sales orders, and record keeping functions. As computer technology evolved, so too did the capability to extract information from data and provide this information to the manager to assist him in performing his job. Eventually managers started to use the information provided by computer in the organization decision making process. This was the beginning of the Management Information System (MIS) concept.

The definition of MIS that relates most closely to this conceptual point of view was expounded by Walter J. Kennevan. "A Management Information System is an organized method of providing past, present and projected information related to internal operations and external intelligence. It supports the planning, control and operational function of an organization by furnishing uniform information in the proper time-frame to assist the decision making process" [Ref. 1: p. 35]. The MIS concept is gaining an important position in the Korean military because the military manager at all levels must have complete, accurate, and timely information to make sound decisions both in peace and wartime.

The first computer was introduced in Korea in March 1967. It was an IBM 360/40 machine. Its purpose was to survey the entire population of Korea. The Republic of Korea Army (ROKA) installed its first computer system, a small UNIVAC 9300, in the ROKA Headquarters in 1969. In 1973, the army set up the computer system in the Automatic Data Processing Center (ADPC) of Logistics Command. The center became fully operational in 1974. Table I shows the computer history in the ROK Army.

The ROK Army used the computer much earlier than civilian organizations. The military utilizes several types of computer centers. The type of computer center is determined by its purpose ,i.e., education, personnel, logistics, intelligence, finance and national security, etc.

TABLE I

COMPUTER HISTORY IN THE ROK ARMY

Times	Unit Level	Computer	Major Application
1969	Headquarters	UNIVAC 9300(32B)	Batch Orientation - Personnel Orientation - Major Statistic Management for ROKA - Accounting and Financial Management
1973	Logistics Command	IBM 370 (256KB)	Equipment Status Reporting - Record Keeping
1976	Headquarters	UNIVAC 90/30	Partial On-Line
1977	Logistics Support Command	UNIVAC 90/30	Partial On-Line
1983	Logistics Command	UNIVAC 1160(512KW)	Logistics On Line Supporting
1984	Headquarters	UNIVAC 1100/80(8MW)	Data Communication MIS (G1-G5) Operation Warning System Supporting

All computer centers are directly controlled by ROK Army headquarters staff. There is one integrated software development center which is located in the headquarters of the ROK Army.

To meet the needs of an MIS, the ROK Army established an MIS committee in 1978. Four major areas of concern were personnel, logistics, finance, and strategy and combat operations.

Since this thesis is concerned with the managers' involvement in information requirements determination in the Department of Deputy Chief of Staff for Logistics (DCSLOG) in the development of a management information system, it focuses on the logistics MIS.

Little activity occurred in the logistics area until 1981, when the system was finally started. Data collection began in 1982. These data were created and gathered from subordinate units. The ROKA demonstrated a partial logistics MIS for inventory control in 1984. Current MIS support is limited to the area of inventory status. Each section of DCSLOG is now using this MIS support.

The collection of data was hampered by duplication of effort and the excessive waste of man-hours, because it was accomplished by the member of Software Development Center (S/W DC) without the manager's involvement and coordination between sections. Managers were simply asked their needs when the analyst had a difficult time in determining information requirements for the manager. Thus, information requirements were biased by the analyst, who had a lack of experience in logistics field. There were also serious inconsistencies between sections when recommendations were made on the basis of the existing data. This causes confusion for the manager/user during his decision making. The problem can be traced back to the lack of communication between sections, managers, and programmers/analysts during determination of the information requirements. As a result, the current Logistics MIS (LMIS) does not satisfy the manager/ user's information needs. This is one of the major causes for failure of the ROKA LMIS. Therefore, the current LMIS needs to increase the manager's involvement in determining information requirements.

This problem also requires joint task forces because of the lack of functional managers' involvement and data

processing personnel. Nicholson noted "The key to system success is total involvement of the users; trite to be sure, fundamental without a doubt". Swanson defined "a prior involvement" of the user as his or her cooperative involvement of in system design, implementation, and operation. Nicholas mentioned that the user involvement is really when users "participate" in defining their needs and in developing systems to meet their requirements [Ref. 2: p23].

Today, top level Korean Army officers want to have an efficient management information system (Kwan Ri Jeung Bo Chea Gye in Korean) in their organization, since more accurate information is required to cope with today's complex and uncertain situations.

Therefore, this thesis will focus on the information requirement determination in the department of Deputy Chief of Staff for Logistics in the development of a management information system. It will provide the reader with an insight and understanding of the concept of MIS development and suggest ways to coordinate with the programer/analyst as manager.

The thesis will be a useful tool for the managers who want to understand the ROK Army logistics MIS and develop the system as manager/user. Chapter II presents the ROK Army Logistics system and the organization of the Deputy Chief of Staff for Logistics (DCSLOG). Chapter III defines the fundamental concepts of management information system design. Chapter IV describes suggestions for the MIS development in the office of the DCSLOG. Finally, Chapter V presents conclusion and recommendations based on the research presented in the thesis.

II. THE ROK ARMY LOGISTICS AND THE DEPARTMENT OF THE DCSLOG

A. ARMY LOGISTICS MISSION AND STRUCTURE

The object of logistics is essentially the movement and support of forces in the field and to ensure the operation of weapons on the battlefield. Army logistics management can be divided into five categories: personnel management, material supply management, service management, facilities management and finance management. Logistics generally can be classified as materials management and physical distribution. Army Logistics usually deals with material supply management that includes the following principal functions: requirement, procurement and acquisition, inventory control, distribution, maintenance and salvage of supplies. Basically, the mission of logistics is to develop and maintain maximum combat power through the support of weapon systems.

In a multi-corps army structure, army headquarters provides overall management of logistics. The army headquarters utilizes a functional component (i.e., Material Management Center in the United States Army) to control and manage selected items which the army commander (i.e., the Chief of Staff) feels are so critical that he must retain control over the material.

Further down, at the division and corps levels, the same functional components as the army level are present and logistics operations are managed by monitoring the operational readiness of weapon systems.

There are three major echelons of logistics support which are determined by type of work done at each echelon: Wholesale Echelon, Intermediate Echelon, and Direct Support/User Echelon.

Wholesale echelon includes depots, maintenance points, plants and factors associated with special army activities retained under army headquarters.

Intermediate echelon provides the major interface between the wholesale and direct support/user echelon. It includes units in the field which provide general support supply, maintenance, transportation, facilities and services.

Direct Support/user echelon includes fields units which provide direct support supply, maintenance, transportation and services. Users include the combat, combat support, and combat service support units utilizing the services and equipment which are logistics responsibilities. These echelons are separated into two systems to manage the Army logistics effectively. They are maintenance and inventory structure.

The three general levels of maintenance used in the Army are Depot, Intermediate and Organizational. The Army may use organic or internal capability for all three levels of maintenance or may obtain contractor support services for any of the required levels. Organic capabilities typically consist of Depot Maintenance, Intermediate Maintenance, and Organizational maintenance.

The depot maintenance level includes the rework of material requiring major overhaul or a complete rebuilding of parts, assemblies, subassemblies and end items.

The intermediate maintenance level includes maintenance which is performed by designated maintenance activities in support of operating units. Maintenance actions includes off-equipment repair or replacement of damaged or unserviceable parts, components or assemblies.

The organizational maintenance level includes those upkeep maintenance functions normally performed by an operating units. Types of maintenance include inspection,

servicing and handling of equipment as well as corrective and preventative maintenance including removal and replacement of defective parts and components.

The Army's inventory system has three levels: wholesale, retail intermediate, and retail consumer. The Wholesale level of inventory is material over which the wholesale inventory manager has visibility and control at the national level.

The retail intermediate level of inventory is a level of inventory required between the consumer and wholesale levels to support a given geographical area, including resupply and consumer level maintenance.

The retail Consumer level of inventory is material held strictly for the units own use or consumption.

B. THE DEPARTMENT OF THE DEPUTY CHIEF OF STAFF FOR LOGISTICS

1. Organization and Mission

Logistics responsibilities are different for different levels of the hierarchy, as mentioned above.

The Department of DCSLOG is the principal logistics advisor to the Army Headquarters Commander. They have general staff responsibility for developing and supervising army logistics organizations and systems including plans, policies, programs, doctrines, procedures and standards. In a multi-corps army structure, this level establishes priorities, allocates resources, and manages selected items (mission-essential) for supply and maintenance operations. Figure 2.1 shows the organization of DCSLOG in Army Headquarters.

The Department of DCSLOG has 6 major sections to operate its functions. Each of the sections is supported by three or four bureaus.

a. Planning and Budgeting Section

This section formulates and prepares logistics plans, prepares the army logistics annual budget requirements, recommends improvement for the logistics support, and conducts staff evaluation and the implementation of logistics programs.

b. Material Supply Section

This section develops policies and procedures for the supply control of common supply items. This section also manages inventory and distribution of these items.

c. Equipment and Maintenance Section

This section formulates and develops policies and procedures for the supply control of weapons and ammunition. This section also develops maintenance and disposal procedures, evaluates inventory status, and establishes guidelines for those items. subusb Communication and Electronics Section

This section's responsibilities include establishing policies and procedures for the supply control of electronics and communication equipment. This section also handles inventory and distribution management. subsub Transportation Section

This section plans and controls the transportation including land, sea and air transportation. subsub Medical Section

This section is responsible for the medical facilities and supplies.

C. ADP SUPPORT

Increased sophistication has generated the requirement for improvements in the logistics systems, specifically for systems designed to improve the management and operation of both the supply support and maintenance functions. The continued growth and utilization of computer with large data storage capacity can provide large amounts of data to managers at all levels.

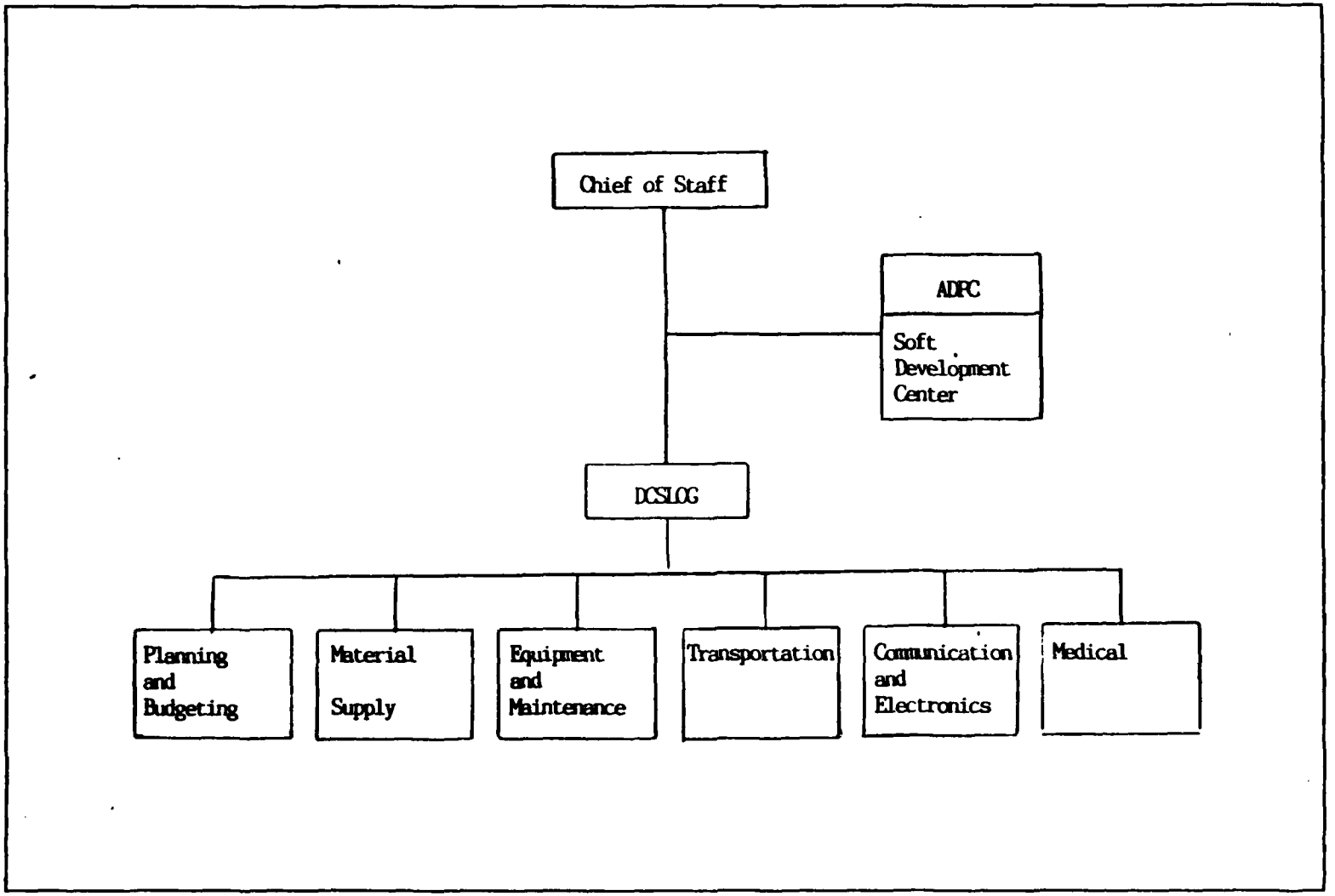

Figure 2.1 The organization of DCSLOG in Army Headquarters.

The ADPC (Automatic Data Processing Center) within the logistics structure provides significant support. In order to effectively command and control operations, the commander must have adequate visibility.

The use of Automatic Data Processing (ADP) systems has significantly increased the commander's visibility and has had an effect on logistics operation.

The ADPC dedicated to logistics operations supports its own internal functions such as inventory controls within its area of responsibility and a routine report for higher command. The report generation functions is the Army Unit Equipment Status Reporting (ESR) System. This reporting system is designed to provide up-to-date accurate equipment status data for selected items pertaining to each army unit.

It provides information needed by the Army headquarters to evaluate the development readiness of military elements in terms of their equipment.

It also indicates shortages or overages of equipment and, when integrated with other reports, allows army headquarters to determine new procurement needs, prepare budgets, redistribute assets and take disposal actions.

The army equipment status reporting system is a command responsibility at all echelons within their respective organizations. All elements are responsible for developing internal procedures for reviewing, editing and verifying the equipment status data reported under this program.

D. THE CURRENT LOGISTICS MIS PROBLEMS

We have overviewed the department of the Deputy Chief of Staff for Logistics in the Army Logistics structure. The current logistics MIS problems will be presented below. These problems come from the lack of efficient organization to support Logistics MIS and the determination of information requirement from the manager.

1. Software Development Center

Since the Army logistics MIS is a new-born system, S/W DC has the primary responsibility for control and management of the whole Army MIS: the personnel MIS, the logistics MIS, the finance MIS and the strategy and combat operations MIS. The membership of this center mainly consists of system designers/analysts who have not had a lot of experience in logistics field.

The major mission of the software development center(S/W DC) is to provide logistics software development and support, establish job processing standardization, develop new technology, collect data and provide summary analysis and guidance for each major section. Designers/analysts in S/W DC are required to work hard in order to compensate for general lack of understanding on the part of the manager with regards to information requirements. Unfortunately, there are serious gaps between managers/users and the member of S/W DC in development of logistics MIS. The responsibilities between the two are not clear in the development of Logistics MIS.

2. Information Requirements Determinations

Information is the trigger for subsequent flow of physical material or for follow-up actions in logistics systems. Information should be used for planning, operating, and controlling the overall logistics systems. Logistics system planning of any magnitude occurs periodically in most military organizations. In the Army, logistic planning is done on a quarterly basis. The costs associated with such planning is allocated for data collection and processing.

In an attempt to acquire the necessary data, data was collected and processed. Although the logistics MIS was intended to achieve a standard system to manage and control logistics' objects and functions, the results turned out to

be far from what the managers expected. Due to the difficulty in determining the information needs of the managers, the system presented inaccurate information. This resulted from a lack of standardization of terms, an integrated code structure of the items, and a determination of what data were actually needed for the collection. In the view of manager involvement, the determination of information requirement is the serious problem.

The principle reason for ROK Army Logistics MIS' failure to perform as expected has been that it has not been meeting the needs of their managers. This problem must be solved to create a successful ROK Army Logistics MIS.

III. MIS DESIGN CONCEPT

A. INTRODUCTION

In Chapter 1 an overview of the origins of ROK Army MIS concept was presented. However, it is difficult to get clear agreement on what an MIS is. As Dearden suggested, it is difficult to describe MIS in a satisfactory way because this conceptual entity is embedded in a mish-mash of fuzzy thinking and incomprehensible jargon [Ref. 3: pp. 90, 91].

An MIS is needed by any modern organization that wants to plan, control and operate its functions by an integrated, computer based system. Due to the general perceptions of MIS within the logistics of the ROKA, an MIS is defined as an integrated, user-machine system for providing information to support operations, management, analysis and decision making functions in an organization. The system utilizes computer hardware and software, manual procedures, models for analysis, planning, control and decision making, and a database. It supports the planning, control and operational function of an organization by furnishing uniform information in the proper time-frame to assist the decision maker. [Ref. 4: p. 6]

Burch, Strater , and Grudnitski mentioned the modern organization that can be viewed as a total system composed of three subsystems: the operations subsystem, the management subsystem, and the information subsystem. The operations subsystem includes all of the activities, material flow and people directly related to performing the primary functions of the organization. The management subsystem includes all the people and activities directly related to determining the planning, controlling, and decision making aspects of the operations subsystem. The information subsystem is an assemblage or collection of people,

machines, ideas, and activities that gather and process data in a manner that will meet the formal information requirements of an organization [Ref. 5: pp. 26, 27].

On the other hand, all systems have several common characteristics. Wysong defined these common characteristics as organization, interaction, interdependence, integration and a central objective. He also presents certain elements or components that describe a system's relationship with its environment. He defines the word "system" as a routine operation of a set of planned procedures to accomplish a specific purpose [Ref. 1: pp. 33, 34]. It further implies a coordinated body of methods within an overall scheme or plan. A system is an orderly and organized chain of events. The first event involves an input into a planned process in which there is a processor that performs certain operations over the input.

The processor provides output which may serve as input to other processors or as feedback to a measurement process. Controls monitor the processor performance by comparing output to some predetermined standards or criteria. The feedback loop reacts to deviations from the standards to maintain established limits of the imposed controls. See Figure 3.1

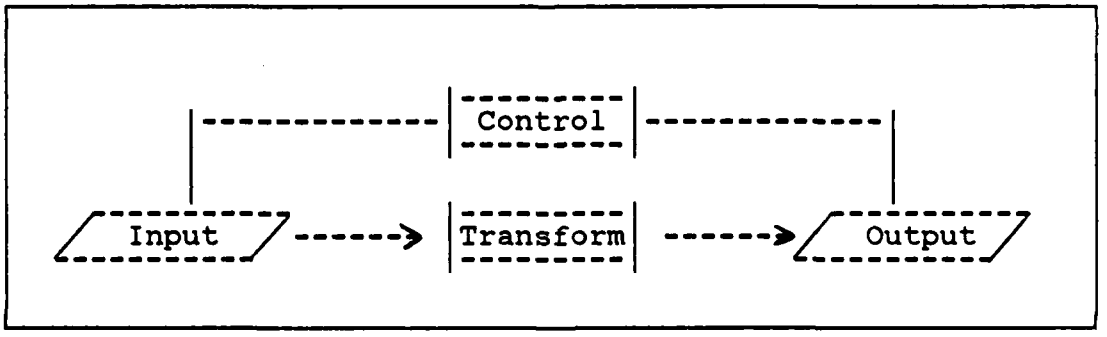

Figure 3.1 The component parts of a system.

A data processing system processes transactions and produces reports. It presents the automation of fundamental, routine processing to support operations. Prior to computers, data processing was performed manually or with simple machines. A management information system is more comprehensive; it encompasses processing in support of a wider range of organizational functions and management processes. One important aspect of the difference between MIS and routine data processing is the capability to provide analysis, planning, and decision making support. An MIS orientation means users have access to decision models and methods for querying the database on an ad hoc basis; the database is also, of course, an essential part of routine transaction processing and reporting. Furthermore, an MIS orientation means information resources are utilized so as to improve decision making and achieve improved organizational effectiveness. Information resources are also used as a means of achieving a competitive advantage. [Ref. 4: pp. 10, 11]

Therefore the MIS in any organization must provide their managers at all levels of management with the information they need to perform their functions of planning and control in the system.

B. DATA VERSUS INFORMATION

The objective of the MIS is to provide the right information to the right user at the right time at the least cost to aid in management decision making. The main input to an MIS is raw data, but, as is true with so many other ingredients, much of the data's ultimate usefulness depends on how it is processed and merged with other elements as data must be processed to become information which will be meaningful to the user. Information can tell managers something that they did not previously know.

Data is the plural of datum, defined as something used as a basis for discussion, decision making, calculating, or measuring. Therefore, a datum is a single item or element of fact, such as the number of hours an employee worked last week, and data are several of these facts, such as the figures for hours worked for all employees in the company. When these data are processed, they can be converted into information. [Ref. 6: p. 13]

The process of transformation from data to information is called either data processing or data transformation. Figure 3.2 Transformation shows this process of changing right information to the right user at the right time at the least cost to aid in management decision making [Ref. 7: p. 144].

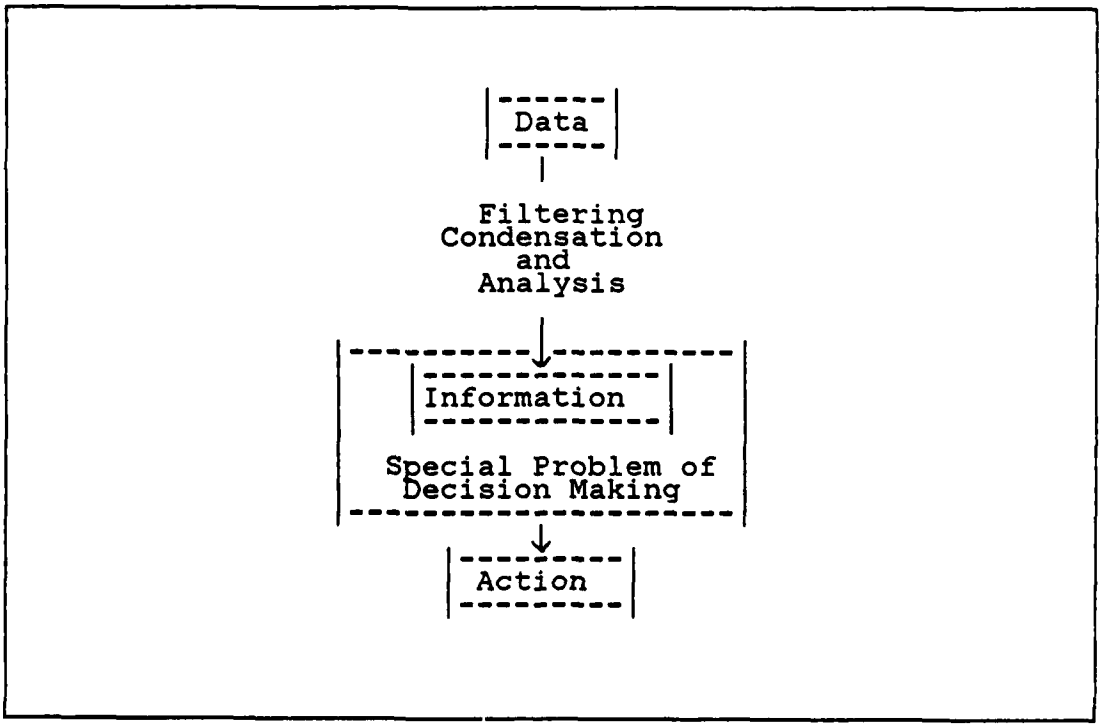

Figure 3.2 Data Transformation.

User information requirements refer to any and all elements of information required by the manager in fulfilling his managerial tasks which are expressed in terms of the content, scope, quality, accuracy, and timeliness of the information required.

The information is required to be transformed differently by different types of decisions. The categories of decision types suggested by Anthony can be considered a framework for information systems. He proposed three types of decisions [Ref. 8: p. 24].

* Strategic planning is the process of deciding on objectives of the organization, and means for achieving them; the planner focuses on the relationship between the environment and the organization.
* Managerial control decisions involve a manager ensuring that resources are used efficiently and effectively to achieve the objectives stated during strategic planning. Managerial control decisions are often subjective in their interpretation of information; interpersonal interaction is important in these decisions.
* Operational control decisions involve ensuring that specific tasks are completed efficiently and effectively.

These three types of decisions come from managers at the three management levels in the organization: strategic (top), tactical (middle), and operational (lower). Davis mentioned that decisions vary as to the degree of structure within each level of management activity, although the majority of decisions at the operational control level are relatively structured and the majority of decisions at the strategic planning level are relatively unstructured [Ref. 4: p. 36].

Management levels have a significant effect on two basic aspects of MIS design. First, they influence the source of data or information, and second, they influence how the information is presented. These design aspects are shown in Figure 3-3 [Ref. 6: p. 44].

According to the figure, top-level managers have a greater need for environmental information than for

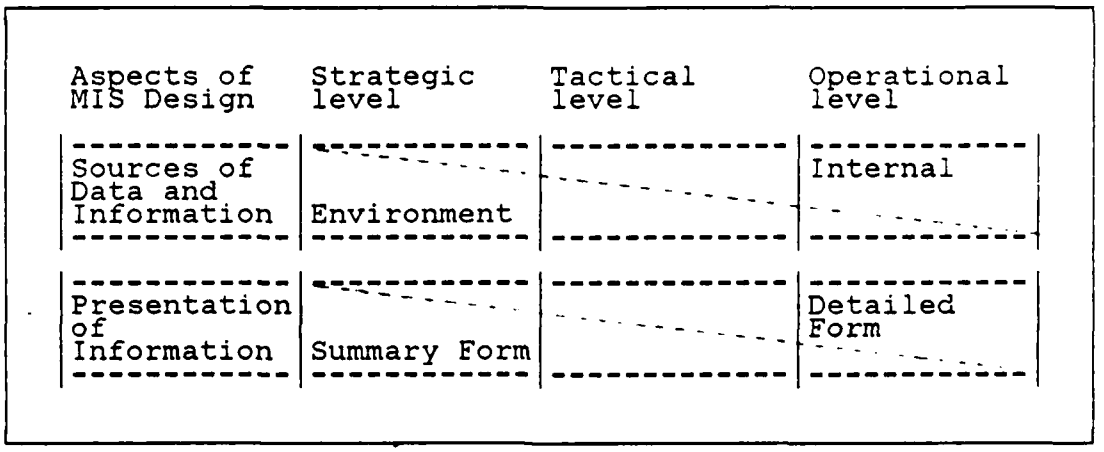

Figure 3.3 Influence of Management Level on MIS design.

internal. The strategic level mostly needs information describing what is happening in the environment, with some information on what is happening within the firm. Tactical-level managers need both environment and internal information. The management level also influences how the information should be presented to the manager. Operational-level managers need detailed descriptions.

Managers at different levels of decision making require different degrees of detail for the performance of their duties. As mentioned above, top level decision makers have lower requirement for detail than either middle or lower decision makers.

Nichols also states that the lowest echelons of management are the most control-oriented, while top management is more planning oriented [Ref. 9: pp. 10, 11]. Figure 3-4 illustrates the relationship between management levels, planning, control, and information [Ref. 4: p. 48].

C. TOP-DOWN VERSUS BOTTOM-UP APPROACH

Two of the most common words in systems development are "top-down" and "bottom-up". These terms relate to the progression through the managerial levels of an organization in determining information requirements.

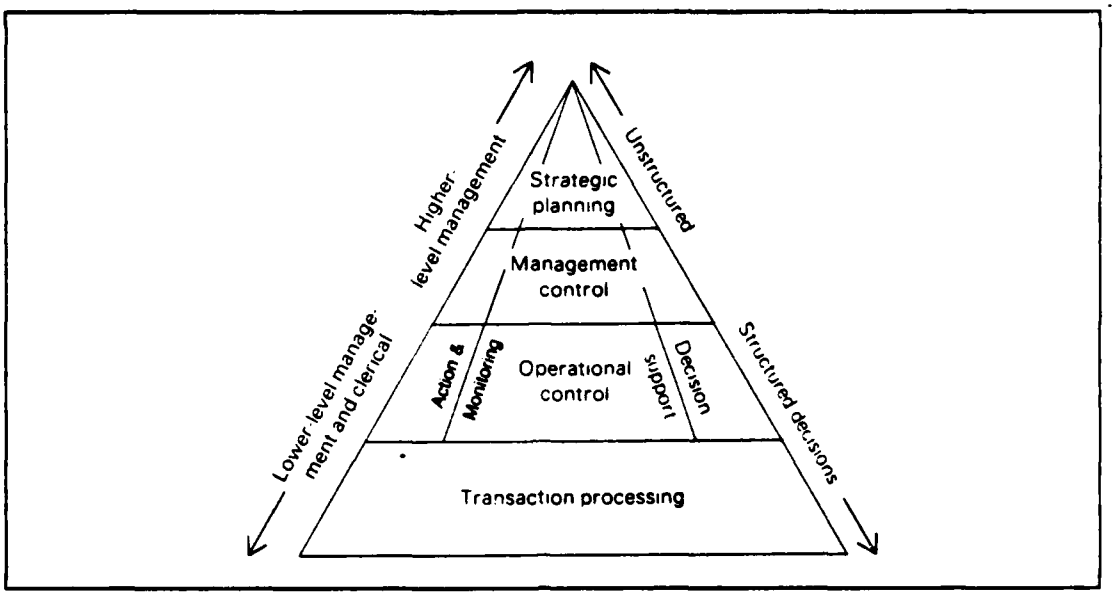

Figure 3.4 Management levels relatings to planning, control and information.

The top-down approach shown in figure 3.5 assumes that once the kinds of information that management needs have been determined, the systems necessary to supply the information can be designed [Ref. 10: p. 27].

Using the top-down approach, the higher levels of management are consulted first, followed by progressively lower-level managers until the entire targeted user community has defined their needs. In contrast, the bottom-up approach involves obtaining the needs of the lowest level managers first then progressing up to top management. The theory behind the top-down approach is that the top level manager is responsible for providing general guidance for the information activity; they define their needs in terms of the overall corporate strategy and objectives. Top management's involvement may be a critical factor in determining the success of MIS development efforts. [Ref. 11: p. 17] The requirements of the lower level managers should fall into place within the top manager's framework. These lower

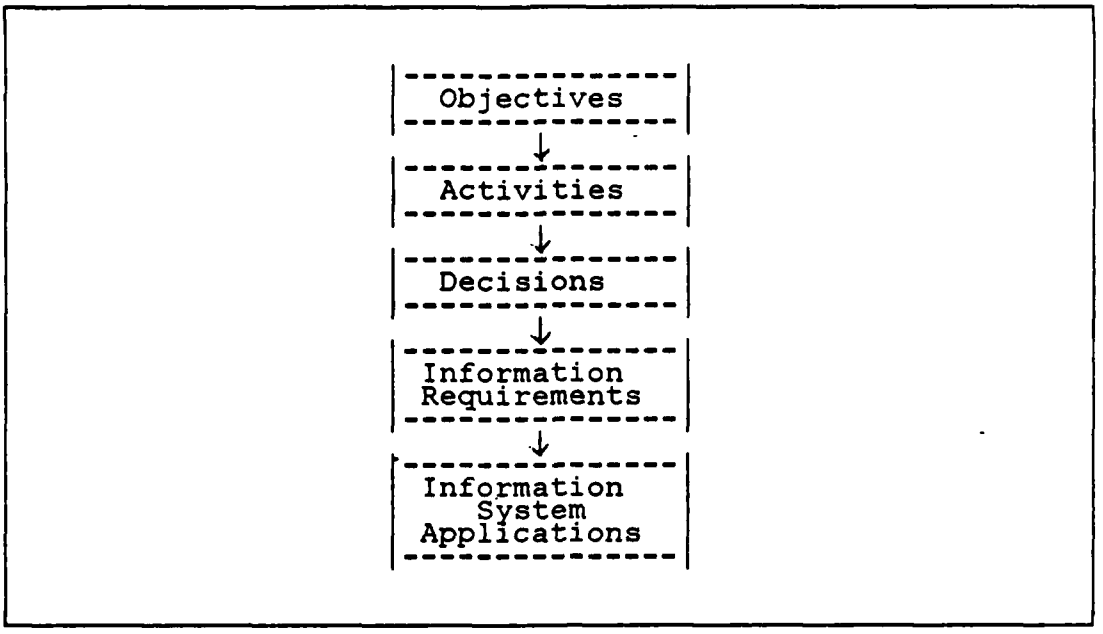

Figure 3.5 Steps in a top-down approach.

level managerial needs are a translation of top management's strategy and policies into action-oriented terms. There are three significant advantages with this approach.

* Top management is more keenly aware of what is and what is not really important to the organization and can pass this along to the analyst, enabling him to focus on the really relevant information.
* This approach avoids the patchwork effect of lower level requirements which may be unrelated to the overall goals of the organization and which subsequently fail to support progress toward achieving those goals.
* Often, if lower level management's efforts are moving in a direction away from top management's objectives or are failing to support them, the top-down approach will detect this, enabling the situation to be investigated and corrected before going any further. If the situation went undetected, any MIS implemented in an organization with such a problem will almost surely fail.

Proponents of the bottom-up approach point out that using their method enables the analyst to already understand the operations and needs of lower level managers before entering into discussions with top management. The bottom-up approach (see Fig 3.6) starts with the subsystems

that produce operational information within some general conceptual framework and then adds the subsystems that produce management information [Ref. 10: pp. 211, 213]. The benefits of this are two-fold. First, it provides an opportunity to sell top management on the need for an MIS, and second, it serves to bring top management up-to-date on current business problems. However, the implication is that top-down is the preferred approach although bottom-up may apply in certain situations. A frequently used top-down technique is the business system planning method developed by IBM.

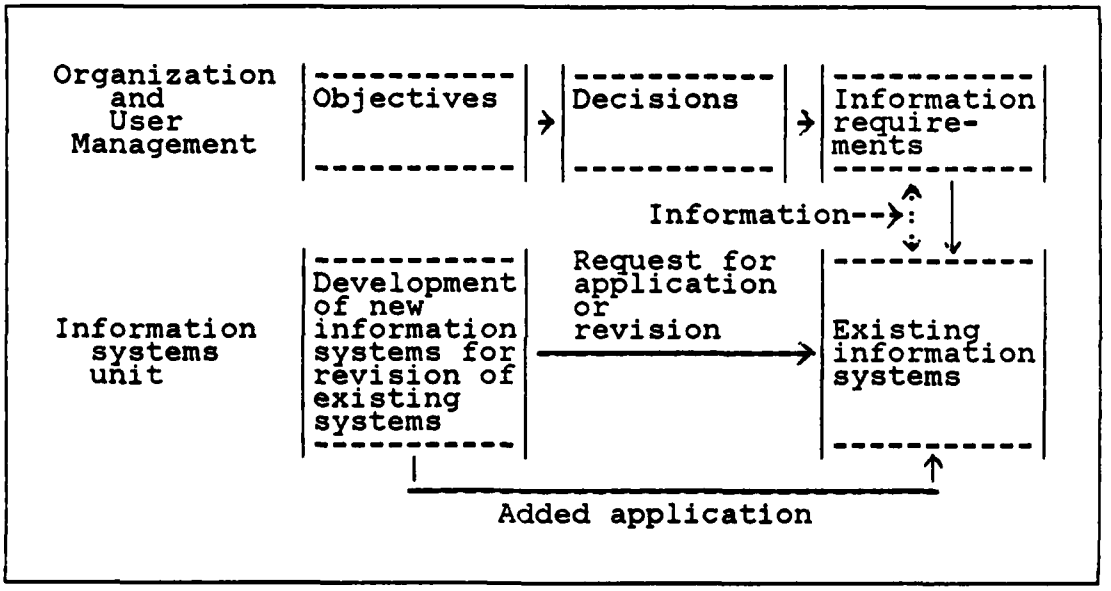

Figure 3.6 The Bottom-Up Approach.

D. USER INVOLVEMENT VERSUS INFORMATION SATISFACTION

The managers for whom ROK Army logistics MIS were designed to serve did not find their outputs as useful as had once been expected. Perhaps the most commonly accepted cause for this "MIS potential-realization gap" [Ref. 12: p. 231], is that not enough attention was paid to the proper

content of the information system during the development process. In other words, the systems were simply not providing the managers with the information they really needed. Taggart and Tharp discuss a national survey conducted by researchers at Colorado State University in 1975 which pointed out that the identification of information needs of management can be considered the most critical factor associated with successful MIS implementation, second only to the definition of system objectives [Ref. 12: P. 231]. Dhar and Davis charge that the information provided to managers was often incorrect, inadequate, inconsistent, ambiguous, or unavailable [Ref. 13: p. 191].

Davis, one of the foremost figures in the field, mentioned that the analysis of information needs has always been one of the most significant problems in information systems design [Ref. 14: p. 41]. Therefore, manager/user involvement is essential in order to develop the MIS especially in information requirement determination phases which can reduce the deviation.

User involvement, defined as participation in the development process by members of the target user group, has been considered in several studies. Terms other than "involvement" have been used to refer to the same process, including "participation", "a prior involvement". [Ref. 15: p. 198]

User involvement can improve all stages of the design process. User involvement develops realistic expectations in the users, and by improving communications it reduces the resistance to change. User involvement is essential for the top-down approach [Ref. 16: pp. 34, 36].

Early involvement, and an open, continuous dialogue among users and systems specialists minimizes later conflict and uncertainty, and reduces the likelihood that something needed will be overlooked, or something not wanted will be included. In systems development, active user involvement

will motivate many people, and cause others to at least alter their plans and attitudes to accommodate the system [Ref. 9: p. 17]. Lower user involvement and poor communication arise largely because managers and designers/analysts can be thought of as representing two separate, divergent "cultures" stemming from their different educational and work backgrounds, different values, and essentially different outlooks on planning and getting work done. [Ref. 17: p. 17] When there are lower user involvement and poor communication in information requirement step, thus, manager's information satisfaction is eventually reduced.

Information satisfaction is the extent to which users believe the system meets their information needs. The concept was introduced in the work of Cyert and March [Ref. 18], which implies that an information system that meets the needs of its users will reinforce satisfaction with that system. If the system does not provide the needed information to managers, the dissatisfied manager will look elsewhere.

To improve the user's information satisfaction, users should be selected from each level of the organization to assist in determining information requirements. They also should have both knowledge and authority to make the best decisions.

User participation in systems development is predicted to improve system quality by [Ref. 19: p. 587]:

* Providing a more accurate and complete assessment of user information requirement
* providing expertise about the organization the system is to support, expertise usually unavailable within the information systems group.
* Avoiding development of unacceptable or unimportant features
* Improving user understanding of the system.

User involvement is expected to lead to greater user information satisfaction, even though the evidence of

relationship is mixed. Therefore, the "common wisdom" of user involvement suggests that it is appropriate for unstructured problems or when user acceptance is important [Ref. 19: p. 601].

E. STAGES OF MIS DEVELOPMENT

If good planning and control do not exist within the framework of a good organizational structure, no degree of sophistication with a computer will cure the basic ill. An MIS must be built on top of a management system that includes the organizational arrangements, the structure and procedures for adequate planning and control, the clear establishment of objectives, and all the other manifestations of good organization and management.

Authors vary in identifying the stages or phases in the development of an MIS. Table II compares the phases as viewed by three different authors.

Davis [Ref. 4: pp. 572, 573] divides the information system development cycle into three major stages: Definition, Development, Installation and Operation.

The first stage is the process which defines the information requirements for a feasible cost-effective system. The requirements are then translated into a physical system of forms, procedures, programs, etc., by system design, computer programming, and procedure development. The resulting system is tested and put into operation. The three stages of definition, development, and installation and operation can therefore be divided into smaller steps or phases as shown in Table III.

Davis also provides a rough idea of the allocation of effort in information system development as percentages. He mentioned that information requirements analysis is the most important phase in the Definition Stage. [Ref. 4: p. 573]

Ross [Ref. 20: pp. 231-267] has described the seven steps in MIS design from the point of view of the manager/

TABLE II

STAGES BY THREE·RESEARCHERS' VIEWS

Davis	Ross	Keim
Proposal definition	Set the systems objectives	Definition
Feasibility assessment	Establish Systems constraints	Specification
Information requirements analysis	Determine information needs	Detailed definition
Conceptual design	Determine information sources	
Physical system design	Detail systems concept	Detailed design
Physical database design		
Program development		
Procedure development	Test and implement the system	Implementation
Conversion		
Operation and maintenance		
Post audit	Evaluate the system	Evaluation

TABLE III

STAGES AND PHASES IN LIFE CYCLE

Stages in life cycle	Phases in life cycle	Comments
Definition	Proposal definition	Preparation of request for a proposed application-
	Feasibility assessment	Evaluation of feasibility and cost benefit of proposed application-
	Information requirements analysis	Determination of information needed
	Conceptual design	User-oriented design of application
Development	Physical system design	Detailed design of flows and processes in application processing system and preparation of program specifications
	Physical database design	Design of internal scheme for data in database or design of files
	Program development	Coding and testing of computer programs
	Procedure development	Design of procedures and preparation of user instructions
Installation and operation	Conversion	Final system test and conversion
	Operation and maintenance	Day-to-day operation, modification, and maintenance
	Post audit	Evaluation of development process, application system, and results of use

user. The managers' involvement are related to each step of the MIS design.

The seven steps involved are not separate and distinct. Most of them are along a continuum, overlap, and are recycled [Ref. 20: p. 231]. The process is iterative: designers

constantly must reexamine and modify prior steps in light of what is learned in subsequent ones.

Setting the MIS objectives emphasizes that objectives must be framed in terms of what they contribute to the organization's objectives and how the processes of planning, organizing, and controlling are furthered. The second step refers to external and internal resources and environmental limitations that affect the optimum design of the system.

Once systems objectives and constraints are established, the manager-designer can proceed to determine the information needs and sources. These should then be matched in order to evaluate whether information is available and whether information needs as defined will accomplish the predetermined objectives.

In detailing the systems concept step which involves detailing the system concept, the actual inputs and outputs are specified and designed to meet information needs.

In test and implement step, testing involves determining whether the system outputs meet the previously defined objectives and information needs. *Implementation is* the process of converting the systems specifications into an operating system.

Finally, the evaluation step measures systems performance against a criteria of effectiveness to determine whether objectives are being achieved.

Keim and Janaro present a definition of the design process in such a way to encourage cost-benefit estimation at each step along the way. In order to assist the system developers and the manager, cost-benefit analysis can be a useful tool if evaluated within the context of the design process [Ref. 21: p. 23].

Such a systems design life cycle would include seven steps: Definition, Specification, Detailed Definition, Selection, Detailed Design, Implementation, and Evaluation.

Each step is described as follows: [Ref. 21: p. 24]

* Definition - the range of alternative system descriptions would be defined in general terms with associated gross costs estimates. PERT/CPM cost techniques as applied to a decision analysis could be used at this level.

* Specification - given the desired output level the management would select a particular cost range along with a system alternative.

* Detailed Definition - at this point since more procedures and requirements will be specified, additional cost estimates and benefits can be determined. At this point the number of alternatives should be limited to a manageable number for the systems analyst to specify. A more detailed, formal cost benefit analysis can then be carried out.

* Selection - given the alternatives and some best estimates of cost and relative benefits the management, along with the systems analysts, can select the alternative best meeting the planning, controlling and decision making requirements for the organization within a reasonably estimated cost.

* Detailed Design - proceeds along with the detailed design using some form of budget or project management controls to apprise the system sponsors of increasing or decreasing cost and benefit trade-offs.

* Implementation -the actual installation, training and initial input activities to cut over to the new system.

* Evaluation - the planned audit and performance criteria applied to the system to foresee the need for system modification or redesign.

Keim and Janaro didn't mention the importance of information requirement determination in detail, however, management requirements should be determined within available resources between manager and cost/benefit analysis in detailed definition step. Then the next step can be a systems design life cycle to reduce cost and increase benefits.

IV. SUGGESTIONS FOR ROK ARMY LOGISTICS MIS DEVELOPMENT

Management information systems are developed to meet the user's need for information. In any MIS design method it is necessary, therefore, to examine the problems and perceive the general requirements for information. As mentioned in chapter 3, information requirement determination is a fundamental requirement in the MIS development. A clear statement of the information needs will minimize any deviation of the MIS development effort from its intended purpose or objective. Thus, information requirements determination step is a critical step that the manager needs to clearly define.

Since it is so difficult for MIS designers in ROKA S/W DC to determine the information needs and to involve managers spontaneously by simply asking them what information they need, this chapter shall offer three possible solutions to the Information Requirement Determination(IRD) problem involving user self-determination of needs. The first is a popular method of user project teams which is currently implemented in numerous organizations, the second is the improvement of S/W DC as an information center and the third is the establishment and utilization of the coordination group and action officer under the current Army Logistics MIS committee.

A. USER PROJECT TEAMS

This methodology involves the use of an MIS project team composed almost exclusively of users. The key position of project manager, especially, should be filled by someone from user management. DP personnel are assigned to do the technical portions of program design and coding and there is

usually one analyst to act as an advisor during the information requirements analysis phase but the rest of team is made of users. Chen mentioned that the project team gets in the way of effective communications when the analyst is unfamiliar with the business terms and methodology involved, and the user is not competent with the technical aspects of a system about which an analyst must be comfortable [Ref. 22: p. 38]. In this way, not only are the users totally involved, but they are directly responsible for the success or failure of the system. Ideally, users will be assigned full-time to the project team (usually on a rotational basis). It is absolutely essential that such an endeavor have the total support of top management.

The difficulty with this technique is the disruption it causes to the users' normal jobs. If assignments are full-time, some assurance must be provided to the individuals concerned that their career progression will not be hampered by such an assignment. If users work on the project part-time, the conflict with other duties may cause the project team members to be somewhat ineffective as their efforts are diluted.

Given the proper organizational climate, this method is one of the best available for successful development of relatively large management information systems. In project organization, resources are assigned to projects, each headed by a project directer. The user project team responsibilities are broken down into four major categories - methods and procedures, system output, test coordination and education. [Ref. 23: pp. 10, 11] Figure 4.1 shows the example of the project organization in Army DCSLOG.

The Department of the Deputy Chief of Staff for Logistics can use the project organization for management of the work of system analysts and programmers. The temporary nature of the projects necessitates special organizational

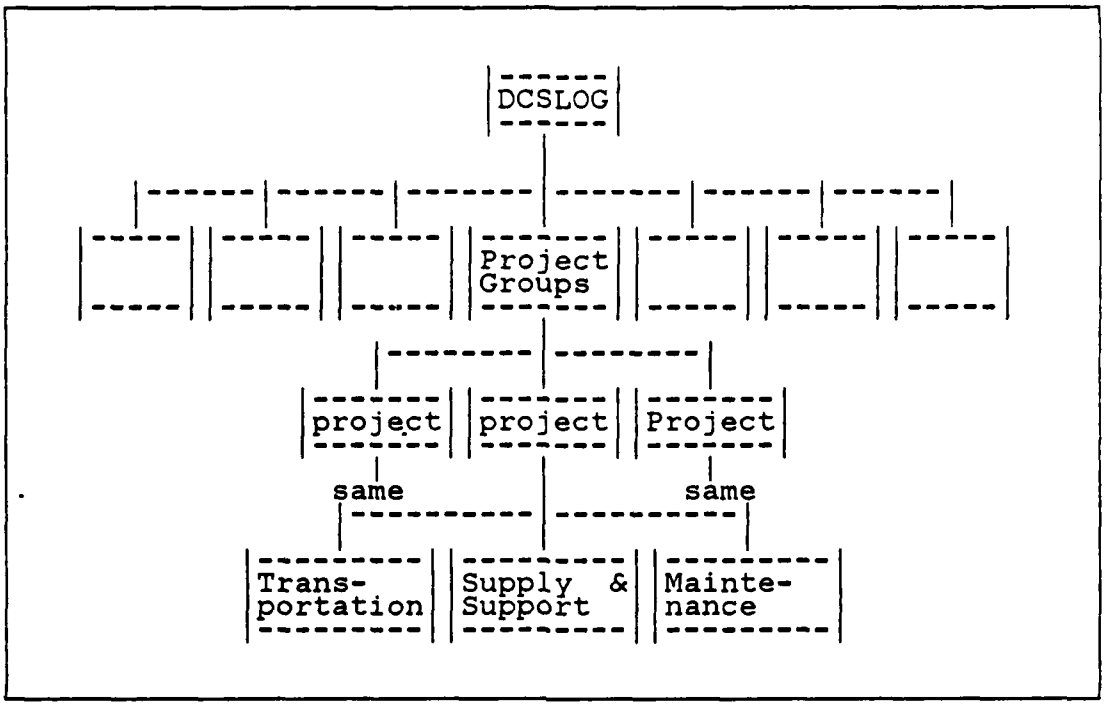

Figure 4.1 Project Organization in ROK Army DCSLOG.

responses to obtain, coordinate, and reassign resources among different projects. A project manager has considerable authority for the duration of a project. [Ref. 4: p. 337]

In user project teams, management education and training are emphasized as a means of increasing manager's involvement, for managers may feel uncomfortable in their new role. Since they may feel too busy to be bothered with determining information requirements, education should be programmed to be a cornerstone for understanding the new activity.

B. THE INFORMATION CENTER

1. The Information Center Concept

This method is to develop the ROK Army S/W DC as information center. The information center concept was developed by IBM around early-1980 and has since caught on with tremendous success. It was developed in response to

the growing backlog of application development requests from which most, if not all, information system centers are suffering. The idea is that if the managers can do some of the minor work by themselves, without having to wait two years or more for the IS (Information Systems) department to get around to it, they can benefit from the productivity increase provided by the minor application much sooner. This translates to overall improved user productivity.

The growth in use of office automation equipment and the new generation of labor force--"computer literate" persons trained to operate personal computers easily--as well as the decrease in the prices of computing equipment and the big market of ready-made software and the friendliness of the personal computer accelerate the trend of proliferation of microcomputers among users who are not information systems professionals. There are some common factors to many of these front-end users: they do not wish to become technical experts in microcomputer operations; they are not prepared to comprehend the horrific jargon, technicalities and acronyms of communications specialists and they do not want to write programs in programming language. They look for a friendly tool that will improve their decision-making process and the effectiveness and efficiency of their job. They expect that somebody else--a computer professional--will resolve the technical problems. This is the origin of the concept of Information Center (IC). [Ref. 10: pp. 372, 373]

2. The Information Center to Support End Users

The IC provides the managers with a terminal, a consultant for training and assistance, and software packages for solving his problem, such as a data manipulation package, report generation package, query package, etc. Thus, Information Center is recommended to have software which include the following: [Ref. 4: p. 428]

* Query software to answer nonroutine information requests. It should allow questions to be formulated in familiar user terms.
* Graphics software to display data in graphic formats.
* Editor to compose, store, retrieve, and print documents.
* Report generator software to produce customized reports easily.
* A financial modeling and planning language for programming.
* A very high level language for programming.
* One or more programming languages useful for end-user programming (such as APL or BASIC).

The Information Center is to help end users/managers participate in information requirement determination, and develop and apply their programs by themselves. In order to aid this job, the Information Center should provide support which includes: [Ref. 4: pp. 427, 428]

* Technical assistance in writing instructions in a very high level language
* Education in the use of high-level language and development tools
* Assistance in accessing data
* Assistance in debugging
* Access to reference material on facilities, databases, etc.
* Administrative support with various computing procedures

With this aid from the Information Center, end users can express their information requirements in a convincing way and develop and apply their own programs. With the active participation of users/managers which is caused by the assistance from the Information Center, the problem of information requirements determination by systems personnel will be eliminated. One of the major problems in information systems development is the need to elicit a complete and correct set of requirements. The problem is made more difficult because the analyst is an outsider who must communicate with a user in eliciting the requirements. Having

users develop their own systems eliminates the problems of inadequate communication between analyst and user. [Ref. 4: p. 429]

L.W. Hammond explains: The objective of an IC is to provide users access to data on their own terms so that they can solve their own business problems [Ref. 24: P. 133]. He goes on to emphasize that the type of work the IC is intended to support is that short job, the one-time query, the simple report, the minor change, etc., and not the work that requires the discipline of formal project development procedures. It is not a replacement for a way around the longer schedules usually required to develop a system [Ref. 24: p. 134]. While this is valid in regard to the original IC concept, it seems that many management-oriented information systems and decision support systems could be more easily and cheaply implemented by the user himself using the IC than by the traditional systems development approach. What this user-developed system would cost in processing inefficiency would probably be much less than what a full-fledged development effort would cost, even for a small system. The author believes that the IC concept should and will move in this direction in the future. Mollen and Bakshi from IBM, report results supporting this contention obtained from certain organizations that have implemented the information center as follows [Ref. 25: p. 7]:

* IBM Canada, Ltd. reported that about 50% of the project requests are being implemented by end user computing.
* The American Automobile Association of Michigan claims, "Soon, our professional programmers will be doing only the difficult jobs, the big online programs, and everything else will be done by the users themselves".

C. THE COORDINATION GROUP

1. The Coordination Group Concept

In Chapter 2, an overview of the current logistics MIS problems was presented. A Logistics MIS system is

needed to improve the coordination between managers and analysts, and reduce the heavy work of the analyst/programer in S/W DC, and establish the responsibilities of the members involved in Logistics MIS. The author suggests it is necessary to establish and utilized the coordination group including action officers under the current MIS Committee.

The development of ROKA Logistics MIS is mainly dependent on the necessary data to produce the measurements required for logistics management informations. For certain logistics management informations, data currently reported to Headquarters in these cases, these Logistics Management Information System (LMIS) can be implemented at any time selected. It will be necessary to establish reporting information requirements to provide necessary data.

2. LMIS Organization Structure

For effective development, the Army Logistics MIS is required the changes of organization structure besides committees. They are suggested below:

* Designate responsible office for logistics management information system.
* Establish LMIS Coordination Group composed with Chief, Area Coordinator and Administrative personnel.

The proposed manning of the LMIS Coordination Group is recommended for better implementation, recognizing that actual operation of the system may dictate some adjustments. It should be noted that quality of personnel is essential to the operation of the system. They should be well qualified in their subject areas, and be capable of communicating their knowledge and assessments in clear and concise terms. Members in the LMIS Coordination group should have a broad knowledge of logistics and the interrelationships among the logistics functional areas. It is desirable that these members have some basic knowledge of statistics and statistical methods.

Stability of assignment and recognition of the priority given the LMIS by the DCSLOG is also essential. Fig. 4.2 represents the change of organization structure.

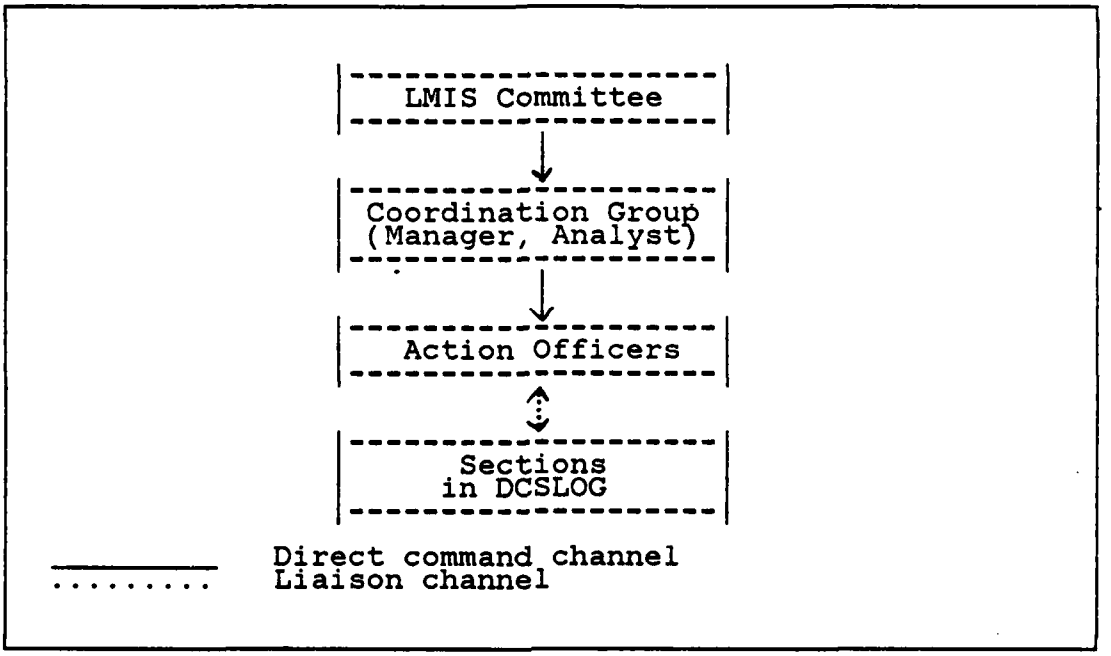

Figure 4.2 Organization Structure for Coordination Group.

3. Mission and Function

a. Action Officers

The action officer is the key to the successful operation of the logistics MIS. He should be the specialist in logistics management information in his assigned area of responsibility. He should act as the source data base custodian for the logistics MIS in his action area. He receives information from reporting activities. He is responsible for insuring that the reports are received on time, and that the reports are checked for completeness after initial data processing. He should maintains liaison with reporting units and each section, and is the individual best able to assess performance in his area of responsibility. Therefore, he should be qualified to determine

whether problems in his assigned area are of sufficient magnitude to require data and information for development of Logistics MIS. He is selected from operational level manager. The forecast of the next periods's trend is an essential element of the Action Officers' analysis. It provides the basis for avoiding surprise and for taking prompt action to resolve problems before they become serious.

The Action Officer should be the expert in the logistics management information area assigned to him. His functions are suggested as follows:

* Receive source data reports (check for completeness and accuracy and follow up for erroneous data).
* Extract required data and information logistics management information systems.
* Compare current data with these for previous periods.
* Analyze reasons for significant changes
* Forecast next period trend, with a brief statement of the basis for the forecast.
* Prepare a brief narrative analysis based on all of above, using a standard analysis guide prepared by the logistics Coordination Group.
* Maintain a source data report file control.
* Assist the Logistics MIS Coordination Group analyst.
* Maintain final logistics MIS analysis and presentation format file received from logistics MIS Coordination group for future review.

b. The Coordination Group

The Logistics MIS coordination group provides the central management of the logistics MIS. It should involve tactical managers as analysts. It ties together information requirements and results obtained from the Action Officers, prepares top level analysis, produces, publishes and distributes the system outputs, maintains a data storage and retrieval system for all users and with the assistance and guidance of the logistics MIS Committee, prepares a complete analysis for the DCSLOG.

These analysts should be specialists in the major areas of DCSLOG interest, and as noted above work with the individual Action Officers. Their analysis should be based upon an overview of their entire area of responsibility, including interrelationships among the logistics management information systems.

Thus, they should provide the broad system analysis which measures and predicts the general status and health of the logistics system between sections, and in each of its major areas of responsibility. The detail functions of the LMIS coordination group are as follows:

* Prepare standard analysis guide for Action Officers.
* Receive data and analysis from Action officers (Check for completeness, accuracy, logic. Follow up to insure completeness of Action Officers' submissions.).
* Review and Analyze all Action Officer reports for internal consistency, interrelated conditions.
* Coordinate with Action Officers.(Confirm answers to unanswered questions, and secure data and analysis from Action Officers for format.)
* Prepare, update and publish the briefing or other presentation material.
* Prepare summary analysis of each major subject area. (Supply and service, Maintenance, Transportation)
* Present individual logistics management information requirements and analysis and the logistics MIS Coordination Group summary analysis to the logistics MIS Committee.
* Based on discussions with and guidance from the logistics MIS Committee, prepare final logistics MIS output analysis.
* Maintain logistics management information products, data storage and retrieval system.(Storage, logistics management information data files, logistics management information analysis and presentations.)
* Retrieval Information Support (Maintain information index, publish retrieval procedures to all users, provide data analysis, formats to users as required.)

c. The LMIS Committee

When the current committee has the coordination group and action officers, the Logistics MIS Committee should provide a top staff-level review of the logistics outputs to provide further insight and depth to the summary

analysis prepared by the logistics MIS Coordination group. The Logistics MIS Committee should provide following function:

* Review analysis prepared by the Logistics MIS Coordination Group.
* Provide further analysis and guidance to the LMIS Coordination Group.
* Recommend to the DCSLOG programs and actions required to improve deficient performance areas, implement approved recommendations. (Assign program to Action Officers or offices. Establish time-phased objectives. Review progress and revise program objectives as required. Report results periodically to the DCSLOG.)

It is essential that all personnel and organizations involved in the operation of the Logistics MIS be thoroughly familiar with the MIS concept, and their responsibilities in the operation of the system. Consequently, thorough training is required. The degree of detail involved in the training depends largely on the responsibilities and functions of the personnel involved. Thus, Action Officers, members of the Logistics MIS Coordination Group, and personnel in subordinate commands providing source data for the system should receive much more thorough and detailed instruction than individuals not directly involved in the day-to-day operation of the system.

V. CONCLUSION AND RECOMMENDATION

Numerous authors have studied the success and failures of MIS, as well as the many examples of MIS development and implementation efforts which have failed due to the inability to meet the user's information requirement/needs. The time is rapidly approaching when the ROK Army Logistics MIS will become a vital part of the operation of the department of Deputy Chief of Staff for Logistics, and the success of that Logistics MIS will depend on the effective involvement of logistics managers.

The current ROKA Logistics MIS does not satisfy the manager's information requirements because Software Development Center (S/W DC) which is staffed mainly by designers/analysts, has most of the responsibility for controling and managing the Logistics MIS. Most designers/ analysts in S/W DC do not have enough experience in the logistics field to understand the full range of MIS requirements. Though some have had careers in logistics, their experience is often limited to more basic or functional areas. On the other hand, DCSLOG managers lack the knowledge of computer-based systems because they were educated over 10 years ago, in the curricula which rarely included computers and the opportunity for postgraduate training is limited.

Consequently, they must rely on the designers/analysts to design the MIS. They are supposed to use guides or procedures suggested by the designers/analysts. They are simply asked by the analysts when they have problems to get informations for developing Logistics MIS. However, it is difficult to get the efficient coordination between managers and designers/ analysts not only because there are communication gaps but also there is no clear job description and

delegation of responsibilities. Therefore, managers/users can not be satisfied with the output provided by the analysts/designers. The dissatisfaction was caused by the low involvement of managers and the lack of communication between managers and analysts. Thus, the ROKA needs to improve the manager's satisfaction and communication between managers and analysts in determining information requirements/needs. To improve manager's satisfaction and coordination between managers and analysts, manager's involvement is essentially needed. Lucas mentioned that the low involvement of managers in developing a system leads to lack of use and dissatisfaction with the system. In most recent research, user involvement in information requirement determination is predicted to improve system quality by providing a more accurate and complete assessment of user information requirement. [Ref. 19: pp. 586 - 587]

Since the objective of this thesis is to increase the managers' involvement in developing the ROK Army Logistics MIS, it suggests three alternatives: User Project Team, Information Center and Coordination Group. These three ideas could increase the managers' involvement in determining information requirements during the Logistics MIS development.

In chapter IV three possible solutions to the ROKA Logistics MIS problems were presented. Each of these alternatives must be evaluated against the following constraints: the external and internal environments, the budget for logistics MIS development, the personnel quantity and quality, cost benefit analysis, and the procedures, etc.

The idea of a User Project Team will increase users' involvement when it is applied well. However, there are some difficulties in applying it in the current ROK Army LMIS. An User Project Team presumes that managers are trained. Most managers of the ROKA LMIS are not familiar

with the computer based systems, and it takes time and resources to train and educate them. Another problem is that controlling personnel assigned to User Project Teams is not easy in the military organizational structure. The project team members may feel insecure about their career, too.

Developing an Information Center in the ROKA LMIS is another good way to secure managers' involvement since it will aid and assist managers so that they can participate in determining information requirements as well as in developing and applying their own programs and taking their responsibilities. However, it could not be easily adapted and utilized in the current ROKA LMIS because there are some constrains in internal and outward environments. The ROKA LMIS does not have a concrete long term plan for a personal computer network which is essential to an Information Center. The use of the personal computer is not yet common in Korea as in other more developed countries. Therefore, managers are more often than not unfamiliar with computers and may feel threatened by the language. Additional resources are needed to acquire hardware and software as hardware is still expensive and software market is as yet not big in Korea. Training and educating the managers so that they can become computer-literate is another burden to overcome to establish an Information Center in the ROKA.

With regard to the degree of manager involvement, these two alternatives mentioned above require managers' high involvement responsibility for virtually everything planned and done. Nicholas defines this level as "delegated" approaches relinquishing most of the authority and effort to the user. Under this conditions, the designer/analyst is available for advice and consultation, but the bulk of systems work should be carried out by the manager/user. [Ref. 2: p. 24] However, it is very difficult for current

ROKA Logistics managers to carry out the bulk of systems work because most of them are not familiar with the computer based system. Thus, it is better for the current LMIS to apply "shared" approaches in the degree of manager involvement. This manager involvement level guarantees some input from the user and ranges somewhere from involving the user to defining the problem and assisting in system design and installation. This level of involvement can engage the talents and insights of both designers and users. Therefore, the author recommends establishing a coordination group which has benefit of "shared" approaches.

Under the current Logistics MIS, establishing a coordination group by adding some well-educated and computer-literate managers to analysts/designers under the already existing Logistics Committee is the most efficient way to increase managers' involvement at the information requirement phase during the development of Logistics MIS. It will have less constraints than the other two alternatives in terms of personnel, budget, organizational structure, and environment.

Concerning personnel, there are a few computer educated managers in the Logistics field, though not many, who can be added to the Coordination Group and Action Officer. They can communicate well with the analysts/designers. They can also stimulate other managers who are their partners to actively participate in determining information requirements. As far as budgetary constraint are concerned, a coordination group is the best alternative because it uses all the existing Logistic MIS resources except for transferring some managers to Logistic Committee. It will also be less expensive to continue to train and educate just a few managers so that they may be informed with the recently developed knowledge than to educate all the managers in the logistics MIS. As they are selected and chosen, they will feel secure in the structure and about their career.

Establishing a coordination group is also easier than the other two alternatives in terms of structure, as it does not bring major changes in the main structure, except for adding some managers to Logistics committee. It can also keep more effective command channel than other alternatives. Thus, the coordination group is recommended as the best alternative under the current ROK Army Logistics MIS.

APPENDIX A

GLOSSARY/ACRONYMS LIST

ADP	Automatic Data Processing
ADPC	Automatic Data Processing Center
DCSLOG	Department of Deputy Chief of Staff for Logistics
DP	Data Processing
ESR	Equipment Status Reporting
IC	Information Center
IRD	Information Requirement Determination
IS	Information System
LMIS	Logistics Management Information System
MIS	Management Information System
ROK	Republic of Korea
ROKA	Republic of Korea Army

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